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Preliminary Nutritional Profile Analysis of Box Tops 4 Education Food Products

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Abstract

The marketing of unhealthy food to children is often cited as a cause of the obesity epidemic.[1] However, most studies that examine this issue evaluated the marketing of food through print or television advertising. This project investigates the marketing of food products to children through incentive based programs, specifically General Mill's *Box Tops 4 Education*. This study undertakes a preliminary systematic analysis of *Box Tops* food items to determine their healthfulness. A subset of all *Box Tops* food products was selected for review and a basic quantitative content analysis of priority nutrients was performed. Priority nutrients were identified based on their relevance to childhood nutrition; they include sugar, fiber, iron, calcium, total fat, saturated fat, and calories per serving. Based of the results of this analysis, average calories per serving is reasonable (151.06 Cal), total fat (5.65 g/serving) and saturated fat (1.67 g/serving) are slightly high, sugar is high (8.08 g/serving), and vital nutrients like fiber (1.79 g/serving), calcium (2% DV), and iron (2% DV) are low. Overall conclusions state *Box Tops* products are relatively unhealthy.

Background

The development of childhood food preferences is multifaceted, but highly influenced by a child's environment and genetics; this includes foods offered at school and at home, parental influence, and direct persuasion from food company marketing efforts.[1-4] The marketing of food products to children is often cited as a cause for concern, given that most advertisements shown to children are for unhealthy foods.[4] However, most studies that examine this issue have examined the marketing of food through print or television advertising, which are not the only ways the food industry markets to children. This project is an attempt to begin to investigate this gap by looking at a marketing strategy that rewards families for purchasing (and thus consuming) specific foods.

The *Box Tops 4 Education* program is an incentive-based marketing tool used by General Mills. This program encourages consumers who buy products containing the *Box Tops* logo to cut them out and send them to school with their K-8th grade child. The school then receives ten cents in return for every *Box Top* collected.[5] There are hundreds of products that General Mills includes in the *Box Tops* program, including breakfast cereals, frozen foods like pizza and frozen yogurt, boxed meals like hamburger helper or taco kits, refrigerated foods like biscuits, yogurt, and cheese, snack foods like granola bars, and applesauce.[6] A quick glance at the list of products that are part of the *Box Tops* program, by a nutrition professional, or even a well-educated consumer, would raise concerns about nutritional value, as the majority of products appear relatively unhealthy. This study undertakes a systematic analysis of *Box Tops* food items to determine whether or not that assumption is accurate, as the nutritional value of foods marketed to families with young children has a number of implications on health.

Childhood Obesity

The prevalence of childhood obesity is a major concern within the medical, public health, and nutrition community. According to the Center for Disease Control (CDC) in 2012, 30% of children under the age of 18 were either overweight or obese.[7] To measure a child's weight status the CDC uses age- and gender-specific growth charts for body mass index (BMI). BMI is not a direct measure of body fat but is considered an acceptable screening tool for most people.[8] If a child is above he 85th percentile for their age and gender then they are considered overweight; if they are above the 95th percentile they are considered to be obese.[8] In 2012, 17% of children and adolescents age 2 to 19 were obese; further breakdown shows 8.4% of 2-5 year olds were obese (a 5.5% decrease from 2004), 17.7% of 6 to 11 year olds were obese (11% increase since 1980), and 20.5% of 12 to 19 year olds.[9]

Nutrition and public health professionals say the 'obesogenic' food environment American children grow up in plays a large role in the diet of many children in the U.S. 'Obesogenic' means that customs and habits of food consumption in this country have become skewed toward high-fat, high-sugar diets and not enough physical activity to make up for it[2]. Several studies have shown diets high in energy-dense foods, solid fats, refined grains, and processed foods are strongly associated with obesity.[2,3,10-18] Along with that, diets low in nutrient-dense foods like fruits, vegetables, whole grains, fiber, low-fat dairy, and healthy fats are associated with a higher incidence of obesity.[2-4] Other lifestyle behaviors associated with obesity risk include eating out frequently, unhealthy food environments in schools, overly large portion sizes, high consumption of sugar-sweetened beverages (like soda), and over-snacking.[2,3,19] Reedy and Krebs-Smith, who represent *The Academy of Nutrition and Dietetics*,

note how, “the landscape of choices available to children and adolescents must change to provide fewer unhealthy foods and more healthy foods that provide less energy.”[2]

Research supports the important role childhood nutrition plays in establishing lifelong eating habits, as the habits developed in childhood persist into adulthood.[1,2,20] Unhealthy habits developed in childhood can lead to obesity in adulthood, and plethora of health problems.[8] Obese children are five times more likely to be obese as adults, and obesity in adulthood is more likely to be severe.[2] Obese children can suffer from risk factors for cardiovascular disease like high blood pressure and high cholesterol. They have an increased risk for impaired glucose tolerance, insulin resistance, and type 2 diabetes. Other complications include breathing problems like asthma and sleep apnea, musculoskeletal pain, joint problems, gastro-esophageal reflux, and fatty liver disease.[8] Obese children may also suffer from psychological and social problems like low self-esteem and discrimination based on their body size.[8] Furthermore, it is known that poor nutrition and obesity lead to disease like type II diabetes, dyslipidemia, heart disease, cancer, dental caries, osteoporosis, and stroke in adulthood.[7,8,10]

Lifestyle behaviors and a child’s food environment are major contributors to the development of obesity.[1-3] Children who are fed high-sugar, high-fat foods develop strong preferences for these foods that persist the rest of their life.[22] Reedy and Krebs-Smith (2010) found the top sources of energy in the diets of American children were grain desserts, pizza, soda, yeast breads, and chicken. The top sources for solid fat were pizza, grain desserts, whole milk, regular cheese, and fatty meats. The top sources for added sugar were soda, fruit drinks, grain desserts, dairy desserts, and candy.[2] Many of the foods that are included in the *Box Tops* program are identical to the foods listed by Reedy and Krebs-Smith as the top sources of energy, fat, or sugar for American children.

Nutrient Needs & Children

According to the *2010 Dietary Guidelines for Americans*, calcium, dietary fiber, and iron are nutrients of concern for children and are often lacking in children's diets.[20] These nutrients come from foods like vegetables, whole grains, lean meats, and low-fat dairy. Additionally, proper caloric balance and intake of the proper percentage of fats are a concern for adolescents.[20] Marketing tools by food companies like General Mills may contribute to the obesogenic food environment by effectively rewarding schools and parents for feeding their children potentially unhealthy foods. It is important to keep in mind that these foods can be consumed in moderation as part of a healthy, balanced diet, however, when they are consumed in excess and in the absence of fruits, vegetables, whole grains, and low-fat dairy a problem may arise.

Marketing Food Products to Children

Another part of the harmful childhood food environment is the marketing done by food companies.[4,10] In the most traditional sense, marketing is thought of as television advertisements. It is estimated that children and adolescents spend about $200 billion per year of their parents' money, much of that being on food products.[4] According to Harris et al, the food industry spends a great deal of money to create strong brand loyalty among children. The average American child sees about 5500 television advertisements per year, 98% of which are commercials selling high-fat, high-sugar, or high-sodium foods.[4] The same is true for 89% of commercials geared towards adolescents.[4] This is alarming because evidence implies that television commercials for food products can increase a child's preference for the food advertised and therefore, their requests to parents for those foods.[10] The same may be said for other, more indirect ways of advertising food to children like those that are part of incentive-based marketing programs.

According to Molnar et al, about 951,000 primary school children in America are exposed to incentive-based marketing efforts in schools for foods that are energy-dense and nutrient-poor.[10] Through their study they found that most American primary schools participate in marketing programs that may contribute to childhood obesity. Children are especially susceptible to advertisements because they are incapable of identifying the persuasive intent behind the marketing strategy. Therefore, they are less likely to be critical of its purpose. Older children, who are more cognitively developed, are also likely to be influenced by marketing in schools because they interpret the food products advertised in schools as being endorsed by their school. Subsequently, they trust it.[10]

Given the potential negatives associated with school-based food incentive programs discussed above, it is worthwhile to question why they persist. Additionally, it is a myth that schools derive a large sum of money from fundraising efforts like the *Box Tops* program. In the 2009-2010 school year General Mills distributed about $69,000 total to all participating schools; on average each school earned about $700.[23] Data collected by Molnar et all showed that school officials who were aware of both the public health concerns and that insignificant money was raised by their participation in incentive programs were in favor of greater regulation of marketing of energy-dense, nutrient-poor foods in schools.[10]

The childhood obesity epidemic, and the possible contribution of incentive marketing programs in schools to the 'obesogenic' food environment for American youth, has led to this project. The purpose of this study is to analyze the overall nutrient profile of General Mills *Box Tops 4 Education* Program food products. It is guided by the following research question: what is the nutrient profile of a subset of food products that are part of the *Box Tops 4* program, specifically in regards to key nutrients of importance during childhood.

Methods

This study was a basic quantitative content analysis of priority nutrients found in foods that are part of the *Box Tops* program. Priority nutrients were identified based on their relevance to childhood nutrition; they include sugar, fiber, iron, calcium, total fat, saturated fat, and calories per serving.

Data Selection

The *2010 Dietary Guidelines for Americans* indicates calcium, dietary fiber, and iron as nutrients of concern for children.[20] It also states proper caloric balance and intake of the proper percentage of fats were a concern for adolescents. There is a growing body of evidence that supports proper nutrition during childhood is greatly important for ideal nutrition throughout the human lifecycle.[1,2,20] This is demonstrated by the growing amount of weight-related diseases among children, like diabetes and hypertension, which were once only routinely seen in adults.[20]

Calories per serving was measured because proper caloric balance is of the utmost importance in maintain a healthy weight. Many children have usual caloric intakes that exceed their energy expenditure, which leads to excess weight gain, and the potential for the weight-related diseases discussed earlier.[20] Sugar was selected as a nutrient of interest because numerous studies have linked high sugar intake to obesity.[2,3,11,12]

Fats are vital for a good nutrition because they support brain function, and aid in the absorption of fat soluble vitamin A, D, E, and K. The proper ratio of saturated and unsaturated is essential.[20] Although the amount of fat consumed is important, the type of fat has a greater impact. A higher intake of saturated fat is associated with high total blood cholesterol and high low-density lipoprotein (LDL) or bad cholesterol. The *2010 Dietary Guidelines for Americans*

published by the USDA state, "Consuming less than 10 percent of calories from saturated fatty acids and replacing them with monounsaturated and/or polyunsaturated fatty acids is associated with low blood cholesterol levels, and therefore a lower risk of cardiovascular disease."[20] For these reasons total fat and saturated fat were selected as nutrients of interest.

Calcium, iron, and fiber were selected because of the significance in achieving optimum health. Calcium is essential for ideal bone health, nerve transmission, muscle contraction, and constriction and dilation of blood vessels.[20] In 4-8 year old males and females, 83% and 67%, respectively, were meeting the adequate intake (AI) for calcium. In 9-13 year olds 23% of males, and 15% of females met the AI.[24] This lack of intake is why calcium was chosen as a nutrient of concern. Iron was chosen because the *2010 Dietary Guidelines for Americans* states iron intake is of much concern for young females. This is because of their increased risk and incidence rates of iron deficiency. Fiber is important for digestive health and it also helps regulate blood sugar and cholesterol.[25] On average a typical American is only consuming 40% of the recommended amount of fiber.[20] The fiber intake among children per day is as follows: males 2-5, 6-11, and 12-19 years old consumed 11.3 grams, 13.7 grams, and 14.9 grams respectively; in females, fiber intake was 10.5, 12, and 13.3 grams for the same age groups. The recommended amount per day for both genders ages 1-3, 19 grams, for both genders ages 4-8, 25 grams, for males age 9-13, 31 grams, and for females ages 9-18 the recommended amount is 26 grams per day. It is clear to see intake is not adequate so for this reason it was chosen as nutrient of interest.[25]

Data Sample

To stay within the scope of a preliminary analysis, a subset of all *Box Tops* food products was selected for review. The sampling method used to determine which foods made the final

sample was a convenience method in which an equal ratio of products a consumer might see as unhealthy and healthy were selected from the total list of products participating in the *Box Tops* program.[6] A whole grain, reduced-fat, reduced-sodium or versions containing fruit or vegetables, etc. was considered a food consumers would perceive as healthy. Regular formulations of a product or versions that would be assumed to be high in fat, calories, sugar, etc. were considered to be perceived as unhealthy by consumers. In other words, the healthy version of the product was a version the consumer would see as a better alternative. A specific example would be Hidden Whole Wheat Brownie Mix verse Chocolate Chunk Premium Brownie Mix verses Low Fat Fudge Brownie Mix.

Data Collection and Analysis

To collect nutrient data on each product selected, an Excel spreadsheet was compiled and the values for each specific nutrient of interest for each food was input. The values entered were based on the amount per serving established on the nutrition facts panel. If an as prepared label was available on the package that is what was used for products like baking mixes or Hamburger Helper meals. Many times the nutritional data was collected from General Mills website or a product-specific website; the food label was used if data was not available online. Once all data was collected the mean and median for each variable was measured. Median was measured because of the wide range of values and so that outliers could have less of an influence on the final analysis.

Results

The results of the nutrient profile analysis are as follows. The mean calories per serving was 151.06 kCal. The median was slightly lower with a value of 130. Total fat per serving was

5.65 grams and the median was 5 grams. Saturated fat averaged 1.67 grams per serving with a median of 1 gram. Dietary fiber had a mean value of 1.79 grams per serving and the median value was 1 gram. For sugar the mean was 8.08 grams per serving. The median was 6 grams. The mean percent daily value for calcium was 6.1% and the mean percent daily value for iron was 6.27%. The medians for calcium and iron were both 2%. The total sample size was 222 products.

Table 1.

Variable	Mean	Median
Calories	151.06	130
Total Fat (g/serving)	5.65	5
Saturated Fat (g/serving)	1.67	1
Dietary Fiber (g/serving)	1.79	1
Sugar (g/serving)	8.08	6
Calcium (%DV/serving)	6.10%	2%
Iron (%DV/serving)	6.27%	2%
n= 222 products		

Implications of this work

Based of the results of this analysis, average calories per serving is reasonable, total fat and saturated fat are slightly high, sugar is high, and vital nutrients like fiber, calcium, and iron are low. Energy requirements per day vary greatly based on age, gender, and activity level. A sedentary 5-year-old female would require about 1,200 calories per day and an active 18-year-old male would require about 3,200 calories per day.[20] Therefore, stating whether the mean and median calories per serving are healthy or unhealthy depends on the individual consuming it. Because of the great variance in energy needs, the conclusion that calories per serving is reasonable is based on a 2,000-calorie diet. That means that on average consuming one *Box Tops* product per day would be 7.5% calories of the diet.

Total fat is slightly high when compared to the recommended percent of total calories that should come from fat. The percentage of calories coming from fat in *Box Tops* products is

about 36%, which is above the American Heart Association's recommendation of 25% to 35% of a child's calories coming from fat.[26] The 2010 *Dietary Guidelines for Americans* suggests that no more than 10% of calories come from saturated fat.[20] Based on the results 9.9% of calories come from saturated fat in *Box Tops* foods. Both fat measurements are on the upper limit for recommendations.

The 2010 *Dietary Guidelines for Americans* states that less than 15% of calories should come from added sugars (recommends a range of 5%-15%) and the American Heart Association are more conservative.[20] They recommend, for women, less than 100 calories a day come from added sugar, and for men, fewer than 150 calories. That translates to six teaspoons a day for women and nine teaspoons for men.[27] The average serving of a *Box Top* food provided about 8 grams of sugar. That is equal to about 2 teaspoons of sugar and one-third the recommended amount for women and about one fourth the recommended amount for men. These recommendations are for adults so it logical to say that children's requirements should be lower. Sugar contributes to about 22% of calories in *Box Tops* Foods. Fat and sugar combined are over half of the calories, 58%, in *Box Tops* foods

As stated above the recommended amount of fiber per day for both genders ages 1-3, 19 grams, for both genders ages 4-8, 25 grams, for males age 9-13, 31 grams, and females ages 9-18 the recommended amount is 26 grams per day.[25] Box Tops Foods on average provide 1.79 grams per serving, 5% to 7% of the suggested amount, which is less than optimal. The mean values for calcium and iron are 6.1% and 6.27% daily value respectively. Neither qualifies for a "good" source claim from the FDA, which must be 10% daily value.[28] It is worth noting the median value for both calcium and iron, 2% daily value, is much lower than the mean. Although certain

products are “good” or “rich” sources of nutrients, an overall snapshot shows that *Box Tops* foods are not able of providing good sources of calcium and iron.

Limitations and Future Research

As this project was intended as a pilot study to begin to investigate the nutrient profile of the foods in the *Box Tops 4 Education* incentive program, there are many limitations that need to be acknowledged. First, there are concerns about the premise of the study. The basis of this project relies on the assumption that by virtue of participation consumers choose and purchase these products. A point for further study would be to see if the presence of *Box Tops* on products changes the buying behavior of consumers with children who attend schools who use the *Box Tops* Program as a fundraising tool. It would also be useful to survey local schools to gather data on their participation in incentive-based marking programs like *Box Tops*.

Second, there are implications that arise based on the products chosen for analysis. As this was a pilot study, and a subset of products was analyzed, there could have been over or under-sampling of specific nutrients based on the product chosen. Products were chosen so that a “best picture” was captured by purposefully including healthy foods. Additionally, as the foods that are part of the *Box Tops* Program are always changing, representing a full picture of the nutrient profile of the program was difficult.

Third, collecting data on the presence of artificial colors and sweeteners were part of the proposed plan for this analysis. Although most food dyes are on the FDA’s GRAS (generally recognized as safe) list they are an item of concern for many health conscious parents[29]. However, because of inconsistences in labeling and time constraints this portion of data was eliminated.

It is important to note that by removing subsets of data could have a dramatic effect of the end result. For example, calcium and iron had very different mean and median values, 6.10% and 6.27% verse 2%. If a food category high or low in a certain nutrient, like granola bars with high fiber content, were not counted the mean measurement for fiber would be lower. Further research could manipulate this data in ways to expose other similar nuances.

Lastly, it is important to note the variables chosen were largely based on the *2010 Dietary Guidelines for Americans*. The *2015 Dietary Guidelines for Americans* are to be published in the fall of 2015.[30] Although no fundamental changes in these recommendations are foreseen, the release of new guidelines could alter the significance of this analysis. In future research the variables selected should be reevaluated based on the most current guidelines.

In the future, should this research expand, these limitations must be addressed.

Conclusion

The hypothesis made at the beginning of this project, *Box Tops* foods are unhealthy and are possibly contributing to the obesogenic environment, turns out to be true. As previously stated proper nutrition during childhood is a key factor in living a long healthy life. Obese children are five times more likely to be obese as adults than children who are not so this evidences the importance of prevention.[2] The *2010 Dietary Guidelines for Americans* stated that key nutrients like fiber, iron, and calcium are lacking in the diets of American children[20], and this project found that those same key nutrients are lacking tremendously in *Box Tops* products.

Ideally, General Mills should make more health conscious, selection of products for *Box Tops* as their incentivized marketing program is potentially contributing to the obesogenic environment American children are exposed to. There are healthier and unhealthier options with

in the list of *Box Tops* food and the frequency of consumption are factors to consider, however, as a whole the products were found to be relatively unhealthy. As stated previously, school officials who were aware of the insignificant amounts of money this programs raised and their contribution to the obesogenic environment were in favor or increased regulation of foods marketing to children their schools.[10] The results of this project are more reason to investigate this issue further. There are many ways to try to improve the obesogenic environment; changing how food is marketing to children is just one those many ways.

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